Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Diagnostic imaging: percentage of final reports for patients aged 18 years and older undergoing CT with documentation that one or more of the specified dose optimization techniques were used.

Source(s)

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Process

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of final reports for patients aged 18 years and older undergoing computed tomography (CT) with documentation that one or more of the following dose optimization techniques were used:

- Automated exposure control
- Adjustment of the milli-amps (mA) and/or kilo-voltage (kV) according to patient size
- Use of iterative reconstruction technique

Rationale

Mettler et al. (2009) estimate that computed tomography (CT) scans account for 17% of total imaging procedures performed in the United States each year and 49% of the collective radiation dose from

imaging procedures. Current advances in technology have resulted in several methods to reduce radiation dose for patients undergoing CT. Studies show that the use of CT dose optimization techniques can reduce radiation dose by 40% to 50% without sacrificing image quality or diagnostic ability (Ozdoba et al., 2014; May et al., 2014; Kalra et al., 2002).

The following evidence statements are quoted verbatim from the referenced clinical guidelines and other references:

CT examinations should be performed only for a valid medical reason and with the minimum exposure that provides the image quality necessary for adequate diagnostic information (American College of Radiology [ACR], 2014).

Radiologists, medical physicists, registered radiologist assistants, radiologic technologists, and all supervising physicians have a responsibility for safety in the workplace by keeping radiation exposure to staff, and to society as a whole, "as low as reasonably achievable" (ALARA) and to assure that radiation doses to individual patients are appropriate, taking into account the possible risk from radiation exposure and the diagnostic image quality necessary to achieve the clinical objective (ACR, 2014).

Facilities, in consultation with the medical physicist, should have in place and should adhere to policies and procedures, in accordance with ALARA, to vary examination protocols to take into account patient body habitus, such as height and/or weight, body mass index or lateral width. The dose reduction devices that are available on imaging equipment should be active; if not, manual techniques should be used to moderate the exposure while maintaining the necessary diagnostic image quality. Periodically, radiation exposures should be measured and patient radiation doses estimated by a medical physicist in accordance with the appropriate ACR Technical Standard (ACR, 2014).

Evidence for Rationale

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

American College of Radiology (ACR). ACR practice guideline for performing and interpreting diagnostic computed tomography (CT). Reston (VA): American College of Radiology (ACR); 2014. 8 p.

Kalra MK, Prasad S, Saini S, Blake MA, Varghese J, Halpern EF, Thrall JH, Rhea JT. Clinical comparison of standard-dose and 50% reduced-dose abdominal CT: effect on image quality. AJR Am J Roentgenol. 2002 Nov;179(5):1101-6. PubMed

May MS, Eller A, Stahl C, Wuest W, Scharf M, Hammon M, Dankerl P, Schlechtweg PM, Allmendinger T, Sedlmair M, Schmidt B, Uder M, Lell MM. Dose reduction in computed tomography of the chest: image quality of iterative reconstructions at a 50% radiation dose compared to filtered back projection at a 100% radiation dose. ROFO Fortschr Geb Rontgenstr Nuklearmed. 2014 Jun;186(6):576-84. PubMed

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. Radiology. 2009 Nov;253(2):520-31. PubMed

Ozdoba C, Slotboom J, Schroth G, Ulzheimer S, Kottke R, Watzal H, Weisstanner C. Dose reduction in standard head CT: first results from a new scanner using iterative reconstruction and a new detector type in comparison with two previous generations of multi-slice CT. Clin Neuroradiol. 2014 Mar;24(1):23-8. PubMed

Primary Health Components

Computed tomography (CT); dose optimization techniques

Denominator Description

All final reports for patients aged 18 years and older undergoing computed tomography (CT)

Numerator Description

Final reports with documentation that one or more of the following dose optimization techniques were used:

Automated exposure control
Adjustment of the milli-amps (mA) and/or kilo-voltage (kV) according to patient size
Use of iterative reconstruction technique

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Importance of Topic
As imaging technology continues to advance, the United States healthcare system has seen an increase in both the type and frequency of imaging studies being performed. The increase in utilization of imaging studies is accompanied by a corresponding increase in cost and exposure to radiation for both patients and healthcare professionals.

From 1980 to 2006, the number of radiologic procedures performed in the United States showed a ten-fold increase while the annual per-capita effective dose from radiologic and nuclear medicine procedures increased by 600% (Mettler et al., 2009).
From 1996 to 2010, the number of computerized tomographic (CT) examinations tripled, while the number of ultrasounds nearly doubled (Smith-Bindman et al., 2012).
From 1996 to 2010, advanced diagnostic imaging (i.e., CT, magnetic resonance imaging [MRI], nuclear medicine, and ultrasound) accounted for approximately 35% of all imaging studies (Smith-Bindman et al., 2012).
From 1980 to 2006, the proportion of radiation exposure that is attributable to medical sources increased from 17% to 53% (Mettler et al., 2009).
In 2006, while CT scans only accounted for approximately 17% of all radiologic procedures performed in the United States, they accounted for over 65% of the total effective radiation dose from radiologic procedures (Mettler et al., 2009).
In 2006, the estimated per-capita effective radiation dose for radiologic procedures in the United States was nearly 20% higher than the average for other well-developed countries (Mettler et al.,

2009).

Diagnostic imaging was prioritized as a topic area for measure development due to a high level of utilization, rising costs, and the need for measures to help promote appropriate use of imaging and improve outcomes.

Opportunity for Improvement
More than 67 million CT scans are performed in the U.S. each year (Mettler et al., 2009). With the increasing number of CT scans being performed, the use of dose optimization techniques becomes more important than ever. As these techniques are relatively new, there is paucity of data related to their current implementation and use. However, one 2013 study by Vance et al. showed significant variability in the use of CT scans based on patient characteristics (e.g., age, sex, race, insurance status) and geographic location. These variations may result in disproportionate radiation exposure for some patient populations. With variability in the use of CT, care must be taken to ensure that dose optimization techniques are applied uniformly across patient populations to minimize excess exposure.

Evidence for Additional Information Supporting Need for the Measure

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. Radiology. 2009 Nov;253(2):520-31. PubMed

Smith-Bindman R, Miglioretti DL, Johnson E, Lee C, Feigelson HS, Flynn M, Greenlee RT, Kruger RL, Hornbrook MC, Roblin D, Solberg LI, Vanneman N, Weinmann S, Williams AE. Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems, 1996-2010. JAMA. 2012 Jun 13;307(22):2400-9. PubMed

Vance EA, Xie X, Henry A, Wernz C, Slonim AD. Computed tomography scan use variation: patient, hospital, and geographic factors. Am J Manag Care. 2013;19(3):e93-9. PubMed

Extent of Measure Testing

Some of the measures in this set are being made available without any prior testing. The Physician Consortium for Performance Improvement (PCPI) recognizes the importance of testing all of its measures and encourages testing of the diagnostic imaging measurement set for feasibility and reliability by organizations or individuals positioned to do so. The *Measure Testing Protocol for PCPI Measures* was approved by the PCPI in 2010 and is available on the PCPI Web site (see Position Papers at www.physicianconsortium.org); interested parties are encouraged to review this document and to contact PCPI staff. The PCPI will welcome any opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

Evidence for Extent of Measure Testing

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance ImprovementÂ® (PCPIÂ®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb.

58 p. [89 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Hospital Inpatient

Hospital Outpatient

Long-term Care Facilities - Other

Skilled Nursing Facilities/Nursing Homes

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Health and Well-being of Communities
Making Care Safer
Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Equity

Safety

Data Collection for the Measure

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Diagnostic Evaluation

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
All final reports for patients aged 18 years or older undergoing computed tomography (CT)

Exclusions
Unspecified

Exceptions
None

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Final reports with documentation that one or more of the following dose optimization techniques were used:

- Automated exposure control
- Adjustment of the milli-amps (mA) and/or kilo-voltage (kV) according to patient size
- Use of iterative reconstruction technique

Exclusions
Unspecified

Numerator Search Strategy

Fixed time period or point in time

Data Source

Electronic health/medical record

Imaging data

Paper medical record

Registry data

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Measure #6: radiation consideration for adult computed tomography (CT): utilization of dose optimization techniques.

Measure Collection Name

Diagnostic Imaging Performance Measurement Set

Submitter

American College of Radiology - Medical Specialty Society

Developer

American College of Radiology - Medical Specialty Society

National Committee for Quality Assurance - Health Care Accreditation Organization

Physician Consortium for Performance ImprovementÂ® - Clinical Specialty Collaboration

Funding Source(s)

Unspecified

Composition of the Group that Developed the Measure

Diagnostic Imaging Measure Development Work Group Members

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National Committee for Quality Assurance: Mary Barton, MD

Financial Disclosures/Other Potential Conflicts of Interest

None of the members of the Diagnostic Imaging Work Group had any disqualifying material interest under the Physician Consortium for Performance Improvement (PCPI) Conflict of Interest Policy.

Measure Initiative(s)

Physician Quality Reporting System

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Feb

Measure Maintenance

This measure is reviewed and updated every 3 years.

Date of Next Anticipated Revision

2018

Measure Status

This is the current release of the measure.

Measure Availability

Source available from the American College of Radiology (ACR) Web site .

For more information, contact ACR at 1891 Preston White Drive, Reston, VA 20191; Phone: 703-648-8900; E-mail: info@acr.org; Web site: www.acr.org .

NQMC Status

This NQMC summary was completed by ECRI Institute on October 13, 2015. The information was verified by the measure developer on November 19, 2015.

Copyright Statement

This NQMC summary is based on the original measure, which is subject to the measure developer's copyright restrictions.

Production

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